FOCUSING IN ON

Procedural Fluency

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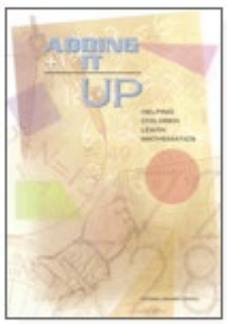
ONE OF THE TWO FOCI for this issue, from *Principles to Actions (PtA)*, is **build procedural fluency from conceptual understanding** (NCTM, 2014). This teaching practice states that: *"Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems."*

I attended Diane Briars session, *Supporting Teachers in Building Procedural Fluency from Conceptual Understanding*, at the NCSM Annual Conference in April, and wanted to share some of her main points.



What is procedural fluency? It is one of the five strands of mathematical proficiency listed in Adding It Up, a 2001 National Academies Press document. Defined as "the skill in carrying out procedures flexibly, accurately, efficiently, and appropriately," procedural fluency is interwoven with the conceptual understanding strand.

Watch the videos from The Marilyn Burns Math Reasoning Inventory—Alan (1000 – 98), Alan (100 – 18), Ana (1000 – 98), Ana (99 + 17), and Marissa (295 students, 25 on each bus)—to determine which of the students demonstrate procedural fluency and jot down evidence for your response.

Procedural fluency can be further explained as:

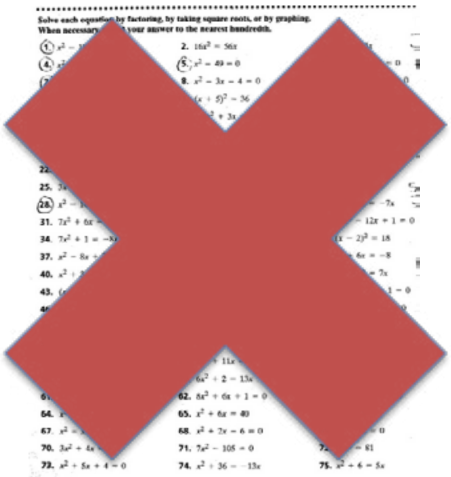
- **Efficiency—**can carry out easily, keep track of sub-problems, and make use of intermediate results to solve the problem.
- **Accuracy—**reliably produces the correct answer.
- **Flexibility—**knows more than one approach, chooses appropriate strategy, and can use one method to solve and another method to double-check.
- **Appropriately—**knows when to apply a particular procedure.

In what ways do these further support your evidence from the above videos?

If you haven't already seen the *Principles to Actions Toolkit*, the Case of "Mr. Harris and the Band Concert Task," check it out. This free NCTM module will provide you with the presentation, presenter notes, and required materials to support your professional learning in analyzing artifacts of teaching (e.g., mathematical tasks, narrative and video cases, student work samples, vignettes) and abstracting from the specific examples general ideas about how to effectively support student learning. In the "Band Concert Task," pay particular notice to the section on *building procedural fluency from conceptual understanding*. (Other free modules are available, as well as additional ones that NCTM members can access.)

What is meant by 'standard algorithm'? Fuson & Beckmann in the 2013 *NCSM Journal* (p. 14) state, "In mathematics, an algorithm is defined by its steps and not by the way those steps are recorded in writing. With this in mind, minor variations in methods of recording standard algorithms are acceptable." Why as I work with pre-service and experienced teachers, are many still providing their students with ONLY the same ONE algorithm they learned themselves as a student? Why are many parents insisting on using this same ONE algorithm with their children? Briars explored multiple variations of algorithmic methods: whole number multiplication, equation solving, dividing fractions, and finding the unknown in proportions in her presentation—only with conceptual understanding a critical part.

Many teachers read this teaching practice—build procedural fluency—and think, “Nothing new here; I’ve been doing this for decades!”



Is there really nothing new? Consider the following from *PtA:*

What are teachers doing?	What are students doing?
Providing students with opportunities to use their own reasoning strategies and methods for solving problems.	Making sure that they understand and can explain the mathematical basis for the procedures that they are using.
Asking students to discuss and explain why the procedures that they are using work to solve particular problems.	Demonstrating flexible use of strategies and methods while reflecting on which procedures seem to work best for specific types of problems.
Connecting student-generated strategies and methods to more efficient procedures as appropriate.	Determining whether specific approaches generalize to a broad class of problems.
Using visual models to support students’ understanding of general methods.	Striving to use procedures appropriately and efficiently.
Providing students with opportunities for distributed practice of procedures.	

Words of wisdom from NCTM President Diane Briars!